

AMENDMENT



SERIAL NO. 09/536,993

REMARKS

Claims 1 - 15 are pending in this application, of which claims 10 - 15 have been withdrawn from consideration. By this Amendment, claims 1 and 3 have been amended and claim 2 has been canceled without prejudice or disclaimer. The applicant respectfully submits that no new matter has been added. It is believed that this Response is fully responsive to the Office Action dated July 2, 2001.

As To The Merits:

As to the merits of this case, the Examiner sets forth the following rejections:

(1) claims 1, 7 and 9 stand rejected under 35 USC §102(e) as being anticipated by Ellerson (U.S. Patent No. 5,859,470); and

(2) claims 2 - 6, 8 and 9 stand rejected under 35 USC §103(a) as being unpatentable over Ellerson in view of Klein (U.S. Patent No. 5,930,889)

Both of these rejections are respectfully traversed.

Claim 2 stands rejected under 35 USC §103(a) as being unpatentable over Ellerson et al. in view of Klein. The Examiner has confirmed that Ellerson et al. fail to disclose or teach the through hole designed to form a constriction in the solder bump as defined in claim 2. The Examiner

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continues “[h]owever, shape and size of the hole in the insulated film is an obvious matter of design choice depending upon the desired performance and the reliability.” Applicant strongly traverses the position of the Examiner.

The invention defined in the amended Claim 1 has been accomplished to realize a better removal of the electronic component from the printed circuit board. As clearly described in the specification of the application, the constriction serves to reliably tear the solder bump in two pieces when the insulated film is taken away from the printed circuit board. It leads to an easier detachment of the electronic component from the printed circuit board. This is why the insulated film is designed to form the constriction in the solder bump. This concept itself is not at all obvious in the art. This concept is not disclosed or even suggested in any of the prior art references cited by the Examiner. Without establishment of this concept, no one can make a design of the through hole in the insulated film as defined in the amended Claim 1. Applicant completely disagrees with the Examiner’s position stating “it is an obvious matter of design choice.” We believe that Klein fails to disclose or even suggest any constriction in the solder bump.

In addition, the constriction in the solder bump also serves to control the amount of the solder remaining on the electronic component and/or the printed circuit board, since the solder bump can be broken into two pieces at the constriction. The position of the constriction in the solder bump is allowed to manage the amount of the solder remaining on the electronic component and/or the printed circuit board. This is why we need the insulated film designed to form the constriction in the solder bump. This concept itself is not at all obvious in the art. This concept is not disclosed or even

suggested in any of the prior art references cited by the Examiner. Without establishment of this concept, no one can make a design of the trough hole in the insulated film as defined in the amended Claim 1. Applicant completely disagrees with the Examiner's position stating. "it is an obvious matter of design choice."

Next, Claim 4 also stand rejected under 35 USC 103(a) as being unpatentable over Ellerson et al. in view of Klein in the outstanding Office Action. Concerning Claim 4, the Examiner states that Ellerson et al. fail to disclose or teach the conductive pad with a surface conductive layer having a corrosion resistance higher than the base conductive layer. Still, the Examiner again continues "[h]owever, a conductive pad covered with a surface conductive layer having a corrosion resistance higher than the base material is known for the apparent reason of protection of the base layer against corrosion and oxidation." Applicant strongly traverses the position of the Examiner.

In some aspect, the Examiner may be correct because it may be obvious to utilize a surface conductive layer having a corrosion resistance higher than the base conductive layer for protection of the base conductive layer from corrosion and oxidation. However, the important feature of the invention defined in Claim 4 resides in the combination of the through hole and the surface conductive layer. See Fig. 5 and the related description of the application, for example. A space defined by the through hole must stand on the surface of the surface conductive layer. When the through hole smaller than the area of the surface conductive layer is allowed to stand on the surface of the surface conductive layer, the melting solder is supposed to reliably stay within the space standing on the surface conductive layer. The melting solder can be prevented from flowing around

the surface conductive layer to reach the base conductive layer. Without the smaller through hole standing on the surface conductive layer, it is impossible to reliably protect the base conductive layer from corrosion and oxidation. The melting solder in this case cannot keep staying on the surface of the surface conductive layer. The melting solder is allowed to flow around the surface conductive layer to reach the base conductive layer.

Last, Claim 8 stands rejected under 35 USC 103(a) as being unpatentable over Ellerson et al. in view of Klein in the outstanding Office Action. Concerning Claim 8, the Examiner states that Ellerson et al. fail to disclose or teach the inner surface of the through hole is covered with a coating wet to the solder. Still, the Examiner once again continues “[h]owever, it is known in the art for better and uniform adherence of the solder to the surface.” Applicant strongly traverses the position of the Examiner.

The invention defined in Claim 8 has been accomplished to realize a better removal of the solder. See Figs. 18 and 19 and the related description of the application, for example. As clearly described in the specification of the application, the coating serves to drag the melting solder when the insulated film is removed from the space between the electronic component and the printed circuit board. This is why the coating is needed, wet to the solder, covered over the inner surface of the through hole. This concept itself is not at all obvious in the art. This concept is not disclosed or even suggested in any of the prior art references cited by the Examiner. Without establishment of this concept, no one can reach the combination of the through hole in the insulated film and the

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coating wet to the solder bump as defined in Claim 8. Applicant complete disagrees with the Examiner's position.

Thus, it is respectfully asserted that the prior art fails to teach or suggest recitations of claims 1 - 9 and requested that the Examiner allow claims 1 - 9, along with the entire application, to issue. Accordingly, withdrawal of the rejection of claims 1 - 9 under 35 U.S.C. §102 and §103 is respectfully solicited.

Attached hereto is a marked-up version of the changes made to the specification and claims by the current amendment. The attached page is captioned "**Version with Markings to Show Changes Made.**"

If, for any reason, it is felt that this application is not now in condition for allowance, the Examiner is requested to contact applicant's undersigned attorney at the telephone number indicated below to arrange for an interview to expedite the disposition of this case.

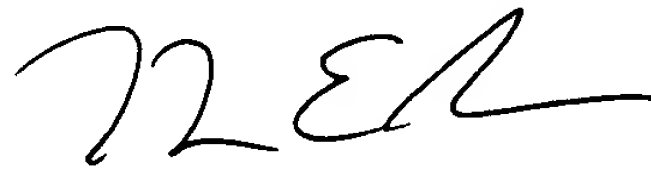
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In the event that this paper is not timely filed, applicant respectfully petitions for an appropriate extension of time. The fees for such an extension or any other fees which may be due with respect to this paper, may be charged to Deposit Account No. 01-2340.

Respectfully submitted,

ARMSTRONG, WESTERMAN, HATTORI,  
McLELAND & NAUGHTON

A handwritten signature in black ink, appearing to read 'TEB', with a stylized flourish at the end.

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**VERSION WITH MARKINGS TO SHOW CHANGES MADE**

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**IN THE CLAIMS:**

Claim 2 has been canceled without prejudice or disclaimer.

Claims 1 and 3 have been amended as follows:

1. (Amended) A printed circuit board unit comprising:

- a printed circuit board;
- an electronic component;
- a solder bump interposed between the printed circuit board and the electronic component so as to fix the electronic component to the printed circuit board; and
- an insulated film disposed between the printed circuit board and the electronic component so as to define a through hole for receiving the solder bump, wherein  
the through hole is designed to form a constriction in the solder bump between the printed circuit board and the electronic component.

3. (Amended) The printed circuit board unit according to claim 1 [2], wherein the insulated film is superposed on the printed circuit board so as to form the constriction right on a conductive pad on the printed circuit board.

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